Extron®

IP Intercom®
Best Installation Practices

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Abstract

The Extron IP Intercom® product is an integral part of a complete help desk solution. With the push of a button, IP Intercom users can communicate with A/V support staff for fast problem resolution.

The IP Intercom integrates easily into any Ethernet LAN; it does not use any special network capabilities for audio delivery. It depends on the normal overhead bandwidth designed into a healthy network and only needs 80 Kbps for a room-to-help desk call. While the IP Intercom is simple to configure and use, it includes advanced capabilities, such as redundancy and manual call load balancing.

The Extron IP Intercom HelpDesk™ software has the capability to "broadcast" to multiple IP Intercom units. This paper covers network bandwidth considerations with respect to the IP Intercom system, as well as firewall issues and the typical benefits of using VLANs.

white paper

Overview: Designed for Simplicity

Extron IP Intercom is an easy-to-use two-way communication system that facilitates room-to-help desk and room-to-room communications. IPI stations are designed for ease of use and ease of integration.

Extron IPI stations feature simple, intuitive controls and operate with a single button - push to talk. One button models and four button models are available for communication with one or four locations.

IPI stations transmit voice data over the network, but do not require special network control. IP Intercom does not require QoS - Quality of Service that would necessitate extensive IT setup or network hardware upgrades. The point-to-point, room-to-help desk voice bandwidth requirement is low and has minimal impact on network traffic. This application relies on industry standard networking best practices of assuring enough over capacity to permit the network to run smoothly.

In this document, we will review some best practices for set up and configuration of the Extron IP Intercom. These guidelines will help in providing a successful IP Intercom deployment.

IP Intercom Hardware Stations

There are two types of Extron IP Intercom hardware stations: the integrated IPI 100 Series and the stand-alone IPI 200 Series.

IPI 101 AAP

IPI 104 AAP

The IPI 100 Series

The one-button and four-button IPI 100 Series IPI stations require an MLC 226 IP MediaLink Controller for operation. The Extron MLC 226 IP is an enhanced control panel for controlling A/V equipment in any classroom or conference room. With large, backlit power and input buttons and a volume control knob, the MLC 226 IP acts as an extended remote control panel, simplifying control of the A/V system. For installation flexibility, IPI 100 Series stations can be mounted in an MLC 226 IP AAP or in a separate AAP - Architectural Adapter Plate mounting frame and positioned anywhere in the classroom, up to 100 feet (30 meters) away from the MediaLink Controller.

Once installed, the intercom station connects to the MLC 226 IP via the intercom port located on the rear panel of the controller. This port provides power, control, and audio transport between the two products. The IPI 100 Series uses the existing MLC 226 IP network connection, resulting in a substantial cost savings since there is no need to install a second network cable drop. Only one IP address is required for A/V system control and IP Intercom.

IPI 201

IPI 204

The Stand-alone IPI 200 Series

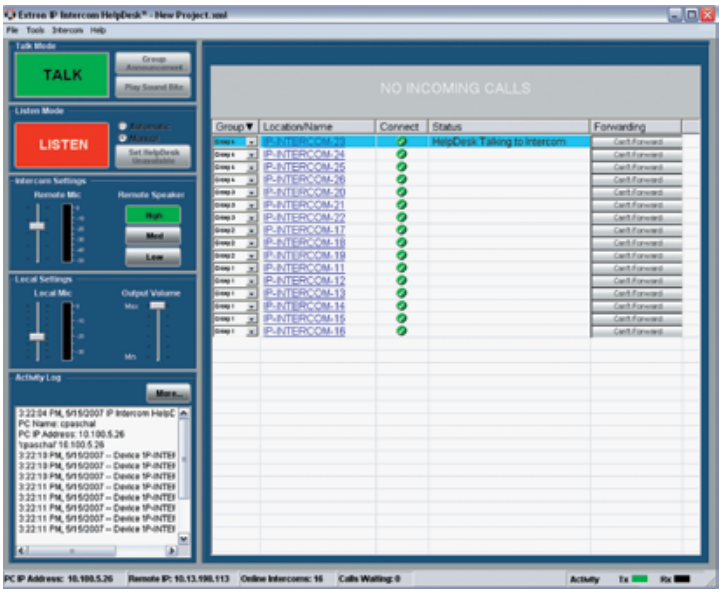
IPI 200 Series IPI stations are standalone IP-addressable stations that do not require a MediaLink controller for operation. Each one has its own RJ-45 Ethernet connector and is powered independently.

The IPI 200 Series consists of one-button and four-button intercom stations available in models that mount in a two-gang wall box or in any Extron product that accepts a four space AAP.

IP Intercom HelpDesk Software

Extron IP Intercom HelpDesk software is used for configuration and operation of IP Intercom systems. The software supports busy forwarding, call routing, and operator unavailable features. Communication between the help desk and an IPI station or between two IPI stations is bidirectional half duplex, meaning that the call can be initiated from either the help desk or the IPI station but two people cannot talk at the same time.

The HelpDesk software can be installed on one computer in a centralized location or on several help desk computers distributed throughout the network. The setup of the HelpDesk software determines the level of cooperation between individual HelpDesk - from complete isolation to complete cooperation. In a system with more than one help desk, the IP Intercom HelpDesk software can be configured as a server, automatically forwarding calls to an available help desk, minimizing busy signals. The ratio of rooms to help desks varies and is a function of your environment, policies, and call-in run rate. Extron advises adding a help desk each time the installed intercom base reaches a multiple of 25-50 rooms.



HelpDesk Software - Main Screen

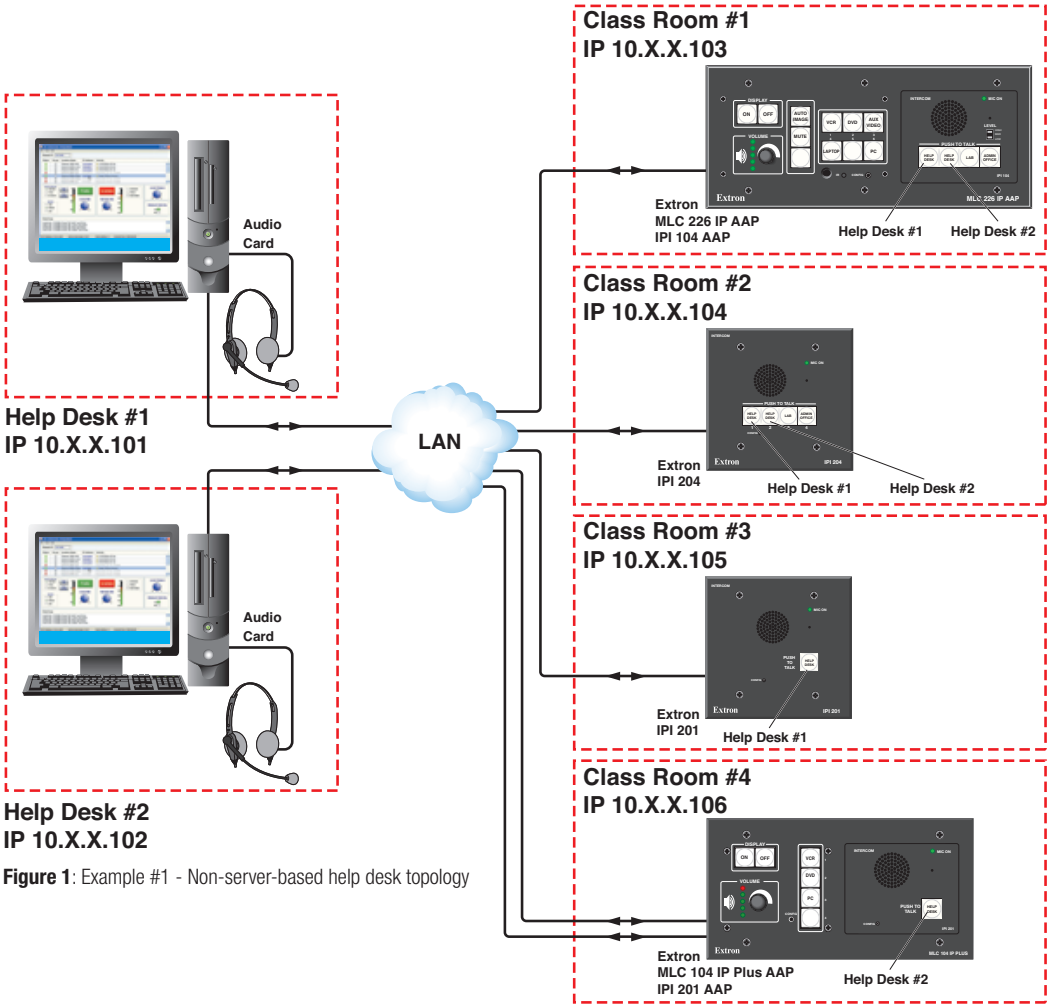


Figure 1: Example #1 - Non-server-based help desk topology

Note: The maximum number of addressable IP Intercoms per help desk is 200.

System Requirements

Extron recommends the following computer configuration for the IP Intercom HelpDesk software:

- Microsoft Windows XP Professional
- Pentium 4, 2 GHz or faster processor
- At least 512 MB RAM
- 500 MB or more available hard disk space
- Windows supported Sound Card, microphone, and speakers
- .NET framework, version 2.0 or higher

Non-Server-Based Help Desk Topology - Example #1

Example #1 shown in Figure 1 has two help desks and shows two methods of distributing the call load. When using the one-button IPI stations, the system should be configured so that the stations are separated into groups and each group is linked to a separate help desk in order to balance the call load. This grouping is illustrated in Figure 1 in classrooms 3 and 4. Four-button IPI stations can be configured with buttons linked to multiple help desks, as shown with classrooms 1 and 2. This configuration provides the additional benefits of redundancy and call load balancing.

Redundancy, Call Load Balancing, and Recovery

The advantage of the two help desk design, shown on opposite page, for classroom 1 and 2 is redundancy and call load balancing. Either help desk can fail but the other help desk is still available. This multiple help desk solution also creates a manual call load balancing solution: if one help desk is busy, users of an IPI station can simply select the next help desk. Each four-button station could connect up to four help desks, providing additional redundancy.

Classroom 3 and 4, in Figure 1, are connected to a single help desk. If it fails, users are without assistance. The recovery plan for this scenario is either a duplicate PC or regular HelpDesk configuration backups for a quick reload of the system configuration.

After configuring or updating the IP Intercom system, backup the configuration on a disk or on a network drive. You can do so by selecting “Save project as” in the “File” menu.

In order to quickly recover from a failure of the main IP Intercom HelpDesk computer, it is a good idea to have a pre-configured backup computer available. The duplicate backup computer and the main computer will have to be configured identically:

- same IP address
- same IP Intercom HelpDesk software version
- same IP Intercom HelpDesk configuration version

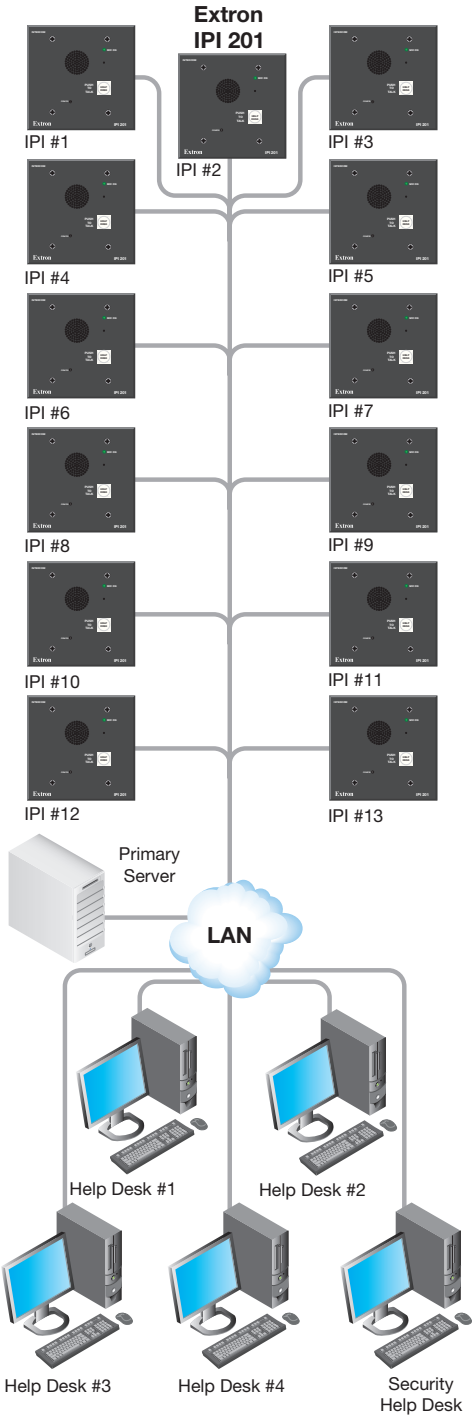


Figure 2: Example 2 – Server-based help desk topology

NOTE: The maximum number of addressable IP Intercom stations is 250.

Note: Because the backup and the primary computers share the same IP address, the backup computer will have to be disconnected from the network until the primary main computer is taken offline.

Server-based Helpdesk Topology Example #2

As shown in Figure 2, the helpdesk software can be set up in a server/client topology. When an intercom user calls for assistance, the server will process the call and forward it to the first available client help desk in the system, based upon the priority the administrator assigned to the client help desk when setting up the system.

The following happens:

- IPI #1 calls for assistance. The server routes the call to help desk #1.
- IPI #2 calls for assistance. The server routes the call to help desk #2.
- IPI #3 calls for assistance. The server routes the call to help desk #3.
- IPI #4 calls for assistance. The server routes the call to help desk #4.
- IPI #5 calls and receives a busy message from the server because all help desks are busy with calls.

Besides eliminating most busy signals another server feature is that the calls are "sticky" so that a follow up call for assistance will be directed back to the help desk assistant that received the original call.

The topology in Figure 2 also shows a security desk as one of the "help desks." For this example the security desk will be set to unavailable during the working hours form 8am to 5pm. The security desk is bypassed from 8-5 when the help desk operators are available answering calls from the IPI Stations. At 5pm the help desk operators set their helpdesk software to unavailable and the security desk signs in and all after hour IPI calls are routed to security.

As described above, the recommended system would provide the following functionality:

- Shared call coverage. Each client help desk (1-4) would be allocated calls from the server help desk, based upon the status of the client help desk. If all client help desks are busy, the caller will receive a busy message from the server help desk.
- Once an intercom has been assigned (forwarded) to a help desk, the system will retain the assignment until the operator assigns the caller back to the pool. This allows an operator at a client help desk to remain the key contact for an intercom so that problems can be resolved - even though the resolution may take several calls over an indeterminate period of time.

- After-hours coverage by an alternate help desk can be managed by simply setting the clients as 'unavailable', and the alternate help desk as 'available'. Calls will be routed automatically as they come in.

- The system has a single point of failure which is the dedicated server. As such, the server should be designed to match the needs of the facility with regard to mission priority. If the intercom system is mission-critical, the server should use fault-tolerant technologies to increase uptime. This is at the discretion of the facility.

Extron GlobalViewer® and Help Desk Working Together

When using the IP Intercom to assist an instructor, the help desk operator can also access Extron's free GlobalViewer Web-based remote asset management application directly from the onscreen hyperlink in the IP Intercom HelpDesk software. This is particularly useful for classrooms using the IPI 100 Series/MLC 226 IP combination. Without disrupting the communication, the help desk operator can use GlobalViewer to quickly check the status of any A/V devices connected to the MLC 226 IP.

GlobalViewer enables remote troubleshooting and aids the help desk operator in better understanding what's happening with the classroom A/V system. The end result is even more effective internal communication and a much higher level of technical support, while saving valuable time, money, and resources.

In systems that include the IPI 100 Series/MLC 226 IP combination, it is recommended that the GlobalViewer Web application also be installed and used.

Network Conditions

Audio packets are affected by latency, packet loss, jitter, and network congestion. If these factors are excessive, the voice quality of the IP Intercom system will be poor.

Using a network simulator, we have tested the overall IP Intercom system performance under different network conditions. Our tests show that, in order for the audio quality to remain good, the following network conditions should be met:

- Packet loss should be less than 2% and no more than three packets per second.
- The network jitter shouldn't exceed 150 ms.
- Out of order packets should be less than 1%.

The following observations of the IP Intercom system were noted during network simulations:

- Voice communication is not affected by fixed latency even when it exceeds 250 ms.
- Audio quality is not affected by bit errors even at a high rate.

Network Bandwidth Considerations

The bandwidth utilized by the normal room-to-help desk connection or room-to-room IP Intercom system is minimal; a single point-to-point audio communication requires only 80 Kbps of bandwidth. This should not impact the network, except for low speed WAN links or oversubscribed network links.

There is one IP Intercom operation where network bandwidth limitations may cause voice quality problems. The help desk has the option to "broadcast" to multiple intercoms at the same time. Each instance of this audio message requires 80 Kbps of bandwidth. As an example, talking or "broadcasting" to 50 classrooms at the same time requires 4.0 Mbps. This increased audio traffic load could exceed the available overhead capacity of a link, creating excessive latency, dropped packets, and jitter, causing the audio quality to be affected.

In order to preserve voice quality and ensure that the announcement is intelligible, you will need to verify that there is enough over capacity designed into the network to handle this extra traffic burst. A rough rule of thumb is to limit the audio traffic to no more than 25% of the maximum available bandwidth. The table below shows the 25% loading bandwidth and the maximum number of IPI stations in "broadcast" mode. As the following table shows, broadcasting should be kept to the local LAN.

	Bandwitdh available (Kbps)	Bandwidth (Kbps)	(25%) bandwidth available for IPI system (Kbps)	Number of IPI Modules
WAN	128 (ISDN BRI)	128	32	0
	192 (lowest speed SHDSL)	192	48	0
	256 (Partial ISDN PRI, Frame relay)	256	64	0
	512 (Partial ISDN PRI, Frame relay)	512	128	1
	1,024 (Partial ISDN PRI, Frame relay)	1024	256	3
	1,544 (ISDN T1, HDSL, Frame relay)	1544	386	4
	2,048 (ISDN E1, HDSL, ADSL)	2048	512	6
	2,320 (SHDSL)	2320	580	7
	3,072 (Dual ISDN T1)	3072	768	9
LAN	10,000 (Ethernet)	10,000	2,500	31
	100,000 (Fast Ethernet)	100,000	25,000	310 (250 max per help desk)

Use Static IP Addresses

Extron strongly recommends the use of static IP addresses for all parts of the IP Intercom system, including any computer hosting the IP Intercom HelpDesk software, any stand-alone IPI 200 Series stations, and any MLC 226 IP/IPI 100 Series station combinations.

If DHCP is used, each IP Intercom IP address needs to be a static entry. The IP Intercom system uses the IP address to send network traffic to a host. The IP Intercom system does not support name resolution. If the IP addresses are changed, the MediaLink configuration and HelpDesk software settings need to be updated.

Protocol/Port	Purpose
UDP 3121	Audio Traffic
Telnet (TCP 23)	MLC 226 IP Control
HTTP (TCP 80)	GlobalViewer
UDP 3122	Inter HelpDesk Communication
UDP 1230/1231	Auto Discovery

Firewalls May Cause Audio Quality Problems

If security is a concern in your environment, we recommend creating a dedicated VLAN for the IP Intercom system and implementing access-lists. Firewalls may block or delay IP Intercom traffic, making the Intercom unusable. If a firewall is necessary, make sure that the following ports are open:

Set Up A Dedicated VLAN

Set up a dedicated intercom VLAN if the intercom IP addresses are on different subnets. IP Intercom communication end points need to reside within the same VLAN or subnet. The auto-discovery capability of the IP Intercom HelpDesk software sends broadcast packets out to the network to discover any IP Intercom installed. A VLAN will forward the broadcast packets and has the added benefit of containing the broadcast traffic to just the interested end points. This helps reduce traffic congestion.

Conclusion

Successful implementation of the IP Intercom does not require network changes; no new network features are needed. The IP Intercom will drop in and work in a network that is not oversubscribed. For better performance, Extron recommends that the IP Intercom and its help desk be on the same LAN, with a static IP address, in a separate VLAN and not pass through a firewall. The additional benefits of redundancy and manual call load balancing can be achieved by simple topology choices.

IP Intercom completes the Extron comprehensive help desk solution; it cleanly integrates with Extron's IP Link® A/V control software and hardware which, through the network, monitors and controls A/V devices. This complete Extron solution provides the help desk with voice communication and direct A/V device status. Immediately, help desk personnel have complete information to begin resolving the problem.

Extron Electronics, headquartered in Anaheim, CA, is a leading manufacturer of professional A/V system products including computer-video interfaces, switchers, matrix switchers, distribution amplifiers, video scalers, scan converters, signal processing devices, Ethernet control interfaces, and high resolution cables. Extron products are used to integrate video and audio into presentation systems for today's high tech boardrooms, presentation/training centers, university lecture halls, and other applications.

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